PROJECT BASIE

PRELIMINARY STORMWATER DESIGN CONCEPT REPORT

Butteville Road
Woodburn, OR

Prepared: April 15, 2021
By:
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Coffman Project No. 210598

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ATTACHMENTS

PROJECT DESCRIPTION

Project Basie includes the construction of a large warehouse facility, paved parking lots, paved vehicle circulation, pedestrian walkways, and paved receiving areas. Located east of Butteville Road, the project includes installing new utility services (domestic and fire suppression water, gas, irrigation, sanitary sewer, telecommunications, and power), parking areas, paved access routes, concrete curbs, sidewalks, storm water management improvements, and landscaping. New curbs and sidewalks will be installed to provide accessible pedestrian routes between the building and parking lots, and right-of-way. The site will include paved vehicle circulation to provide efficient and convenient access throughout the project site.

The project also includes off-site utility extensions (sewer, water, and storm) and road upgrades to the frontage along Butteville Road, including road widening, paved pedestrian walkways, concrete curbing, stormwater management improvements, and landscaping.

The property is bounded by Butteville Road to the west, warehouses to the east, State Highway 219 to the north, and undeveloped land to the south. The project is located in the City of Woodburn, Sections 11 and 14, Township 5 South, Range 2 West, W.M., City of Woodburn, Marion County, Oregon (see Vicinity Map, Attachment “A”).

PRE-DEVELOPMENT SITE CONDITIONS

The existing site is undeveloped and is relatively flat with about 15 feet of elevation change from south to north. The existing site is predominantly cultivated fields, with minimal slopes. The lowest elevation is located in the northwest corner of the site and the highest elevations are located in the south portion of the site. Stormwater runoff follows the natural landscape and flows southwest to northwest towards the low spot of the project site. An existing wetland and seasonal creek, Senecal Creek, are located adjacent to the northwest corner of the site. Stormwater from the site surface flows to the low spot of the project site and infiltrates into the existing wetlands and Senecal Creek. There do not appear to be any existing treatment facilities for the existing stormwater runoff.

SOIL INFORMATION

Preliminary soil information for the existing soils is provided via Web Soil Survey by the Natural Resources Conservation Services (NRCS). The Web Soil Survey indicates the existing site is predominantly Woodburn silt loam, hydrologic soil group C. Soils classified as hydrologic soil group D are also found on-site based on previous geotechnical reporting (GeoDesign, 2016). Therefore, the majority of the site soils have low infiltration rates when saturation occurs. Refer to Attachment “B” for additional information regarding NRCS Web Soil Survey Information for the existing soils.

DOWNSTREAM ANALYSIS

Metered release and overflow stormwater runoff from the proposed development will discharge to the existing wetland and seasonal creek, Senecal Creek, located adjacent to the northwest corner of the site. Refer to Attachment “C” for additional information regarding TMDLS and 303(d) listings for Senecal Creek, per Oregon’s 2012 Integrated Report by the DEQ. The stormwater runoff discharge from the proposed project shall not impact the existing concentrations listed.

Stormwater best management practices (BMPs) will be installed to eliminate site pollutants (oil, petroleum, sediment, etc.) from entering receiving water bodies. The BMPs installed for the post-development management system will be adequately operated and maintained. A Conceptual Operations and Maintenance Manual will be created for the final stormwater management report. BMPs will also be installed during construction to protect existing adjacent water bodies and monitor pH levels of the existing soils due to on-site cement mixing during construction.

METHODOLOGY

Storm water management is provided in conformance with the City of Woodburn Storm Drainage Master Plan (SDMP), Marion County's Engineering Standards, and the Standard Local Operating Procedures for Endangered Species (SLOPES V, 2014) developed by the National Marine Fishery Service (NMFS).

The Santa Barbara Urban Hydrograph (SBUH) Method is used to determine the water quality and storage volume and flow control requirements – with a 2-year and 10-year return frequency, respectively. The SBUH Method is used to find the peak flow runoff rate for both the pre-development and post-development conditions, utilizing precipitation values from the NOAA precipitation Atlas. Refer to Attachment "C" for precipitation table.

POST-DEVELOPMENT STORMWATER MANAGEMENT APPROACH

On-site development consists of a warehouse building, paved vehicle and pedestrian access, paved parking areas, and landscaping. The following table summarizes the impervious and pervious areas, based on preliminary site plan design concepts.

POST-DEVELOPED ON-SITE BASIN INFORMATION SUMMARY TABLE

Basin Area	Asphalt (CN[1] =98)	Roof (CN[1] =98)	Sidewalks (CN[1] =98)	Lawns (CN[1,2] =84)	Total Area (acres)
Entire On-Site	33.46	14.51	4.73	31.32	**84.02**

1 Curve Numbers from Autodesk Storm and Sanitary Analysis (SSA) software (See Supporting Figures, Attachment "C")
2 A conservative, blended curve number for lawns assuming 50% soil group C and 50% soil group D was used based on preliminary soil information.
3 See Attachment "D" for calculations

The off-site development consists of frontage improvements to Butteville Road, including road widening, paved pedestrian walkways, concrete curbs, and stormwater management improvements. The following table summarizes the impervious and pervious areas, based on preliminary site plan design concepts.

POST-DEVELOPED OFF-SITE BASIN INFORMATION SUMMARY TABLE

Basin Area	Asphalt (CN[1] =98)	Roof (CN[1] =98)	Sidewalks (CN[1] =98)	Lawns (CN[1,2] =84)	Total Area (acres)
Entire Off-Site	1.83	-	0.31	0.72	**2.86**

1 Curve Numbers from Autodesk Storm and Sanitary Analysis (SSA) software (See Supporting Figures, Attachment "C")
2 A conservative, blended curve number for lawns assuming 50% soil group C and 50% soil group D was used based on preliminary soil information.
3 See Attachment "D" for calculations

The on-site and off-site swales will be sized per the SLOPES V requirements. The swales will be designed to store stormwater runoff from the water quality and detention storm events, as well as function as flow control facilities.

The swales will store the 2-year, 24-hour water quality storm event, based on 50% of the NOAA 24-hour precipitation for a 2-year storm event. The swales will also store the 10-year, 24-hour detention storm event, based on 50% of the NOAA 24-hour precipitation for a 10-year storm event. Therefore, the swales will adequately store both the 2-year and 10-year design storms, respectively.

The stormwater will temporarily pond in the swales until it reaches a metered outflow structure, located within the swales. Once this occurs, storm water will discharge to a storm water main adjacent to Butteville Road or a storm water main at the north end of the subject site, and discharge to Senecal Creek located adjacent to the northwest corner of the project site. The metered outflow structures will regulate the outflow rate of the post-development site to the pre-development outflow rate. Additional overflow structures will be located within the swales, set at appropriate elevations, to regulate runoff rates and prevent overtopping in the occurrence of a 100-year storm event.

The following tables summarize the results of the hydrology calculations. The runoff rate and maximum ponding depth in the swales are calculated using the Santa Barbara Urban Hydrograph (SBUH) Method. The calculations were performed utilizing Autodesk Storm and Sanitary Analysis (SSA) software. See hydrology calculations in Attachment "D".

PRELIMINARY ON-SITE SWALE GEOMETRY SUMMARY TABLE

Swale	Bot. Elevation Area (sf)	Top of Swale Area (1' of Freeboard) (sf)	Total Volume (3' Water Depth) (cf)
1	4,858	10,280	20,433
2	4,886	10,333	20,545
3	33,211	51,847	120,358
4	11,392	18,423	41,845
5	11,881	19,154	43,584
6	46,049	67,408	161,869
7 (North)	63,388	77,049	205,294
		TOTAL:	**613,927**

ON-SITE WATER QUALITY, DENTENTION, AND FLOW CONTROL SUMMARY TABLE

Storm Event	Peak Runoff Rate[2] (cfs)	Max Ponding Depth in Swales (ft)	Pre-Dev. Peak Runoff Rate[2] (cfs)	Proposed Metered Outflow (cfs)
2 Year and 10 Year Combined	37.92	2.76	21.40	21.40

1 Peak Runoff Rate based on precipitation rates per NOAA Precipitation Atlas (See Supporting Figures, Attachment "C")
2 Runoff calculated using the Santa Barbara Urban Hydrograph (SBUH) Method.

PRELIMINARY OFF-SITE SWALE GEOMETRY SUMMARY TABLE

Swale	Bot. Elevation Area (sf)	Top of Swale Area (1' of Freeboard) (sf)	Total Volume (3' Water Depth) (cf)
1	41	332	187
2	615	4,348	2,482
3	244	1,749	997
4	1,074	7,561	4,318
5	53	133	93
		TOTAL:	**8,075**

OFF-SITE WATER QUALITY, DENTENTION, AND FLOW CONTROL SUMMARY TABLE

Storm Event	Peak Runoff Rate[2] (cfs)	Max Ponding Depth in Swales (ft)	Pre-Dev. Peak Runoff Rate[2] (cfs)	Proposed Metered Outflow (cfs)
2 Year and 10 Year Combined	1.47	0.60	1.47	1.47

1 Peak Runoff Rate based on precipitation rates per NOAA Precipitation Atlas (See Supporting Figures, Attachment "C")
2 Runoff calculated using the Santa Barbara Urban Hydrograph (SBUH) Method.

Refer to the Preliminary Overall Drainage Plan in Attachment "E" for additional information.

CONVEYANCE

The stormwater conveyance systems for on-site and off-site will follow the Marion County requirements. Stormwater piping will be sized to adequately convey the 25-year storm event with a minimum velocity of 3 feet per second. The conveyance system and associated pipe calculations will be included with the final stormwater drainage report.

CONCLUSION

The above-described system of stormwater control explains the preliminary stormwater management approach for the Project Basie project. The system shall provide adequate water quality, detention, and meet flow control requirements.

See attachments for additional information.

VICINITY MAP

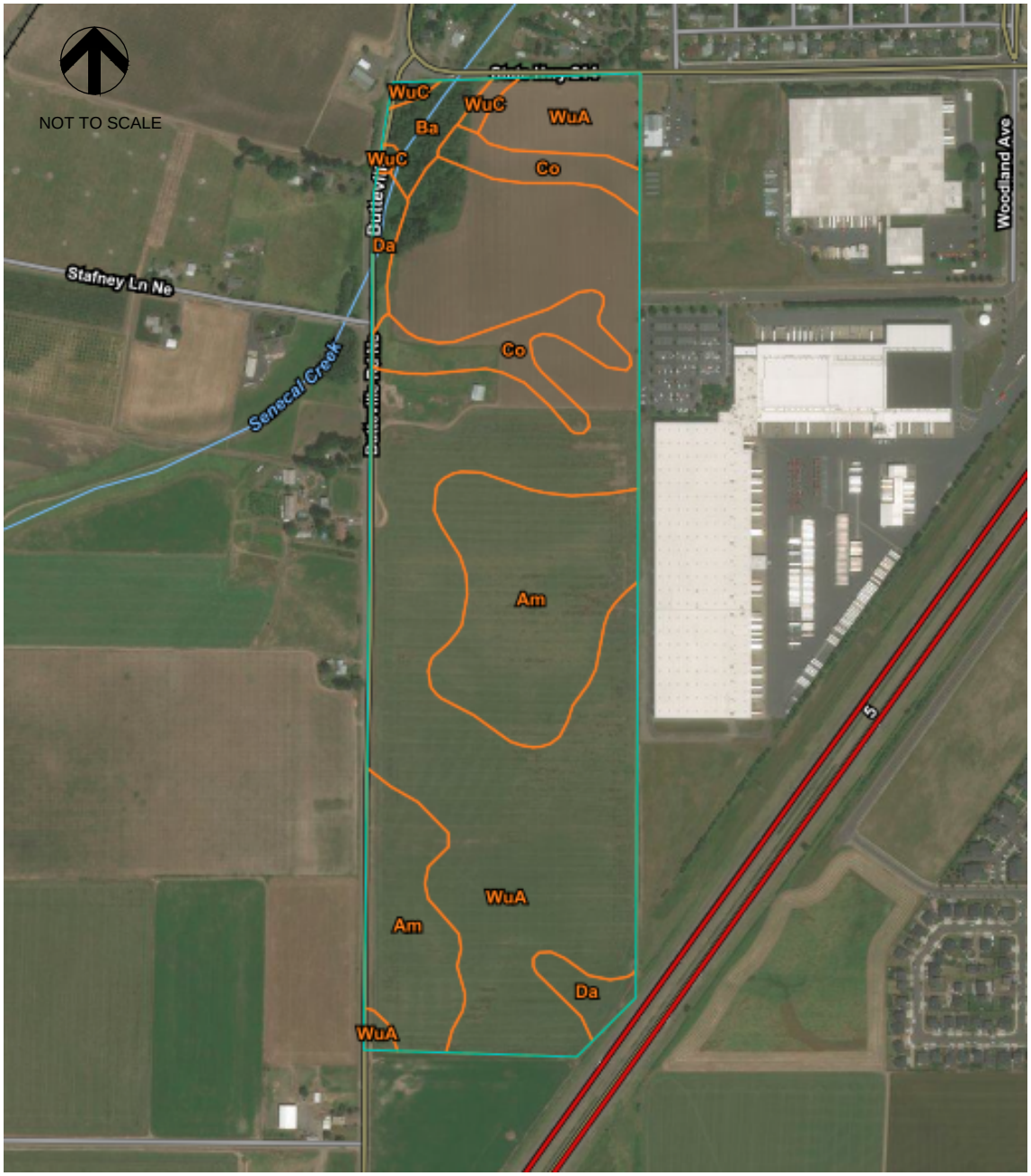
ATTACHMENT “A”

VICINITY MAP

ATTACHMENT “A”

NRCS WEB SOIL SURVEY INFORMATION

ATTACHMENT “B”



Map Unit Legend

Marion County Area, Oregon (OR643)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Am	Amity silt loam	27.3	23.2%
Ba	Bashaw clay	2.6	2.2%
Co	Concord silt loam	8.5	7.2%
Da	Dayton silt loam	3.4	2.9%
WuA	Woodburn silt loam, 0 to 3 percent slopes	74.6	63.5%
WuC	Woodburn silt loam, 3 to 12 percent slopes	1.1	0.9%
Totals for Area of Interest		**117.5**	**100.0%**

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TITLE: NRCS WEB SOIL SURVEY INFORMATION

PROJECT: PROJECT BASIE

SHEET NO: EX. 1

PROJ. NO. 210598
DATE 04/12/2021

CHECKED CJH
DRAWN CLJ

SUPPORTING FIGURES

ATTACHMENT “C”

Storm Event	NOAA 24-HR Precipitation (inches)
2 year	2.4
5 year	3.0
10 year	3.5
25 year	4.0
100 year	4.5

Water Body	TMDL or 303(d) Listing
Senecal Creek	BHC Gamma
	Chlorophenoxy Herbicide - Silvex
	Chlorophenoxy Herbicide
	Chlorpyrifos
	Dissolved Oxygen
	Guthion
	Malathion
	Parathion

NOAA PRECIPITATION ATLAS SUMMARY and TMDL - 303(d) LISTING BY DEQ

ATTACHMENT “C”

SCS Curve Numbers for Urban Areas[1]					
Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type and Hydrologic Condition	Average Percent Impervious Area[2]	A	B	C	D
Fully Developed Urban Areas (Vegetation Established)					
Open Space (Lawns, Parks, Golf Courses, Cemeteries, etc.):[3]					
Poor condition (grass cover <50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover >75%)		39	61	74	80
Impervious Areas:					
Paved Parking Lots, Roofs, Driveways, etc.					
(excluding right-of-way)		98	98	98	98
Streets and Roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western Desert Urban Areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban Districts:					
Commercial and business	85%	89	92	94	95
Industrial	72%	81	88	91	93
Residential Districts by Average Lot Size:					
1/8 acre or less (town houses)	65%	77	85	90	92
1/4 acre	38%	61	75	83	87
1/3 acre	30%	57	72	81	86
1/2 acre	25%	54	70	80	85
1 acre	20%	51	68	79	84
2 acres	12%	46	65	77	82
Developing Urban Areas					
Newly Graded Areas:					
(pervious areas only, no vegetation)[5]		77	86	91	94

[1] *Average runoff condition, and Ia = 0.2S.*

[2] *The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986.*

[3] *CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.*

[4] *Composite CN's for natural desert landscaping should be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986, based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.*

[5] *Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.*

CURVE NUMBER

ATTACHMENT “C”

SCS Curve Numbers for Cultivated Agricultural Lands[1]

Cover Description			Curve Numbers for Hydrologic Soil Group			
Cover Type	Treatment[2]	Hydrologic Condition[3]	A	B	C	D
Fallow	Bare Soil	-	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Raw Crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR+CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C+CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+CR	Poor	65	73	79	81
		Good	61	70	77	80
Small Grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR+CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C+CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-Seeded	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1]Average runoff condition, and Ia = 0.2S.
[2]Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.
[3]Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good >= 20%), and (e) degree of surface roughness.
Poor: Factors impair infiltration and tend to increase runoff.
Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

CURVE NUMBER CONTINUED

SCS Curve Numbers for other Agricultural Lands[1]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition	A	B	C	D
Pasture, Grassland, or Range - Continuous Forage for Grazing[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow - Continuous Grass, Protected from Grazing and Generally Mowed for Hay	-	30	58	71	78
Brush - Brush-Weed-Grass mixture with Brush the Major Element[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[4]	48	65	73
Woods - Grass Combination (Orchard or Tree Farm)[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[4]	55	70	77
Farmstead - Buildings, Lanes, Driveways, and Surrounding Lots	-	59	74	82	86

[1]Average runoff condition, and Ia = 0.2S.
[2]Poor: <50% ground cover or heavily grazed with no mulch.
Fair: 50% to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only ocassionally grazed.
[3]Poor: <50% ground cover.
Fair: 50% to 75% ground cover.
Good: >75% ground cover.
[4]Actual curve number is less than 30; use CN = 30 for runoff computation.
[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
[6]Poor: Forest litter, small tress, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

SCS Curve Numbers for Arid and Semiarid Rangelands[1]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition[2]	A[3]	B	C	D
Herbaceous - Mixture of Grass, Weeds, and Low-Growing Brush, with Brush the Minor Element.	Poor	-	80	87	93
	Fair	-	71	81	89
	Good	-	62	74	85
Oak-Aspen - Mountain Brush Mixture of Oak Brush, Aspen, Mountain Mahogany, Bitter Brush, Maple, and other Brush.	Poor	-	66	74	79
	Fair	-	48	57	63
	Good	-	30	41	48
Pinyon-Juniper - Pinyon, Juniper, or both; Grass Understory.	Poor	-	75	85	89
	Fair	-	58	73	80
	Good	-	41	61	71
Sagebrush with Grass Understory.	Poor	-	67	80	85
	Fair	-	51	63	70
	Good	-	35	47	55
Desert Shrub - Major Plants include Saltbush, Greasewood. Creosotebush, Blackbrush, Bursage, Palo Verde, Mesquite, and Cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and Ia = 0.2S. For range in humid regions, use "SCS Curve Numbers for other Agricultural Lands."
[2]Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30% to 70% ground cover.
Good: >70% ground cover.
[3]Curve numbers for group A have been developed only for desert shrub.

CURVE NUMBER CONTINUED

HYDROLOGY CALCULATIONS

ATTACHMENT “D”

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***4/15/21***
BY: CLJ

COFFMAN ENGINEERS
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Spokane, WA 99201
(509) 328-2994

BASIN: **Entire On-Site Pre-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 84.02 Acres 3659945 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN
Asphalt	0	0	0.00	0.00	98	0
Sidewalks	0	0	0.00	0.00	98	0
Building / Roof	0	0	0.00	0.00	98	0
Grass / Landscaping	0	3659945	0.00	84.02	94	7898
Gravel	0	0	0.00	0.00	89	0
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN
			0.00	84.02		94

Total Impervious 0.00 0%
Total Pervious 84.02 100%

TIME OF CONCENTRATION

Ct =	0.15	Ct = 0.15
L1(A) =	3000	L1 = Length of Overland Flow
N(A) =	0.4	N = friction factor of overland flow (.4 for average grass cover)
S(A) =	0.005	S = average slope of overland flow
Time of Con. (mins) =	51.75	Tc (overland) = Ct*(L1*N/S^0.5)^0.6)

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2	1.20	SCS Type 1A 24-hr

*50% of the total rainfall depth (inches)

Runoff Rate

Peak Flow (cfs)
7.48

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 10 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
10YEAR24HR	Intensity	inches	Oregon	Marion	10	1.75	SCS Type 1A 24-hr

*50% of the total rainfall depth (inches)

Runoff Rate

Peak Flow (cfs)
13.92

See next page for storage requirement calculations

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***4/15/21***
BY: CLJ

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10 North Post St., Suite 500
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(509) 328-2994

BASIN: **Entire On-Site Pre-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY AND DETENTION

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
COMBINED	Intensity	inches	Oregon	Marion	2 and 10	2.95	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches) for both 2 year - 24 hour and 10 year -24 hour*

Runoff Rate

Peak Flow (cfs)
21.40

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *4/15/21*
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Entire On-Site Post-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 84.02 Acres 3659945 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN		
							Total Impervious	
Asphalt	1457485	0	33.46	0.00	98	3279	52.70	63%
Sidewalks	206033	0	4.73	0.00	98	464		
Building / Roof	0	632051	0.00	14.51	98	1422		
Grass / Landscaping	0	1364376	0.00	31.32	84	2631	Total Pervious	
Gravel	0	0	0.00	0.00	89	0	31.32	37%
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN		
			38.19	45.83		93		

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

PROVIDED SWALE GEOMETRY

Swale Number	Bot. Elevation Area (sf)	1' Depth Elevation Area (sf)	2' Depth Elevation Area (sf)	3' Depth Elevation Area (sf)	Top of Swale (1' of Freeboard) Elev. Area (sf)	Total Volume (cf)
1	4858	6128	7456	8840	10280	20433
2	4886	6163	7496	8886	10333	20545
3	33211	37785	42416	47103	51847	120358
4	11392	13065	14794	16580	18423	41845
5	11881	13614	15404	17251	19154	43584
6	46049	51280	56584	61960	67408	161869
7	63388	66719	70106	73549	77049	205294
Total:	175665	194754	214256	234169	254494	613927

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2.00	1.20	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
14.10	1.13	0.00	0.00

Outflow

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
14.10	7.48	7.48

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 10 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
10YEAR24HR	Intensity	inches	Oregon	Marion	2.00	1.75	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
23.82	1.80	0.00	0.00

Metered Release

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
23.82	13.92	13.92

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *4/15/21*
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Entire On-Site Post-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY AND DETENTION

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
COMBINED	Intensity	inches	Oregon	Marion	2 and 10	2.95	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches) for both 2 year - 24 hour and 10 year -24 hour*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
37.92	2.76	0.00	0.00

Outflow

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
37.92	21.40	21.40

STORM WATER MANAGEMENT CALCULATIONS -

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BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Entire Off-Site Pre-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 2.86 Acres 124394 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN
Asphalt	37967	0	0.87	0.00	98	85
Sidewalks	0	0	0.00	0.00	98	0
Building / Roof	0	0	0.00	0.00	98	0
Grass / Landscaping	0	86427	0.00	1.98	94	187
Gravel	0	0	0.00	0.00	89	0
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN
			0.87	1.98		95

Total Impervious 0.87 31%
Total Pervious 1.98 69%

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2	1.20	SCS Type 1A 24-hr

*50% of the total rainfall depth (inches)

Runoff Rate

Peak Flow (cfs)
0.54

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 10 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
10YEAR24HR	Intensity	inches	Oregon	Marion	10	1.75	SCS Type 1A 24-hr

*50% of the total rainfall depth (inches)

Runoff Rate

Peak Flow (cfs)
0.93

See next page for storage requirement calculations

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***4/15/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Entire Off-Site Pre-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY AND DETENTION

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
COMBINED	Intensity	inches	Oregon	Marion	2 and 10	2.95	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches) for both 2 year - 24 hour and 10 year -24 hour*

Runoff Rate

Peak Flow (cfs)
1.47

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *4/15/21*
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Entire Off-Site Post-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 2.86 Acres 124394 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN	
Asphalt	79538	0	1.83	0.00	98	179	Total Impervious
Sidewalks	13399	0	0.31	0.00	98	30	2.13 75%
Building / Roof	0	0	0.00	0.00	98	0	
Grass / Landscaping	0	31457	0.00	0.72	84	61	Total Pervious
Gravel	0	0	0.00	0.00	89	0	0.72 25%
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN	
			2.13	0.72		94	

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

PROVIDED SWALE GEOMETRY

Swale Number	Bot. Elevation Area (sf)	1' Depth Elevation Area (sf)	Total Volume (cf)
1	41	332	187
2	615	4348	2482
3	244	1749	997
4	1074	7561	4318
5	53	133	93
Total:	2027	14123	8075

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2.00	1.20	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
0.56	0.36	0.00	0.00

Outflow

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
0.56	0.54	0.54

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 10 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
10YEAR24HR	Intensity	inches	Oregon	Marion	2.00	1.75	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
0.91	0.46	0.00	0.00

Metered Release

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
0.91	0.93	0.93

See next page for storage requirement calculations

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *4/15/21*
BY: CLJ

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10 North Post St., Suite 500
Spokane, WA 99201
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BASIN: **Entire Off-Site Post-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY AND DETENTION

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
COMBINED	Intensity	inches	Oregon	Marion	2 and 10	2.95	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches) for both 2 year - 24 hour and 10 year -24 hour*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1.47	0.60	0.00	0.00

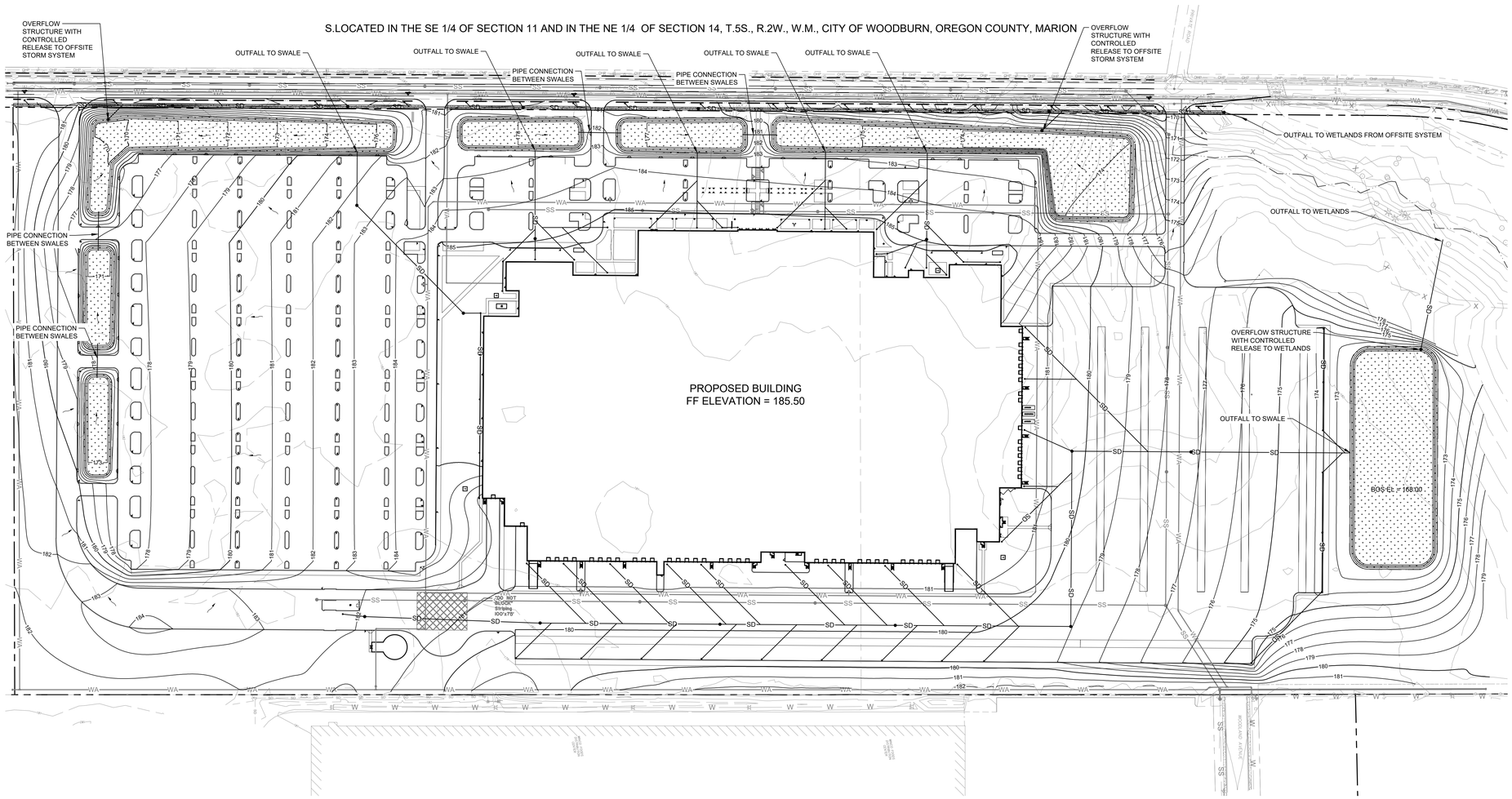
Outflow

Post-Dev Peak Flow (cfs)	Pre-Dev. Peak Flow (cfs)	Proposed Metered Outflow (cfs)
1.47	1.47	1.47

PRELIMINARY OVERALL DRAINAGE PLAN

ATTACHMENT “E”

S.LOCATED IN THE SE 1/4 OF SECTION 11 AND IN THE NE 1/4 OF SECTION 14, T.5S., R.2W., W.M., CITY OF WOODBURN, OREGON COUNTY, MARION



LEGEND

- BIO-INFILTRATION SWALE BOTTOM
- 170 EXISTING CONTOUR
- 170 PROPOSED CONTOUR
- PROPERTY LINE
- SD STORM PIPE
- CATCH BASIN
- ROOF DRAIN CONNECTION
- STORM DRAIN MANHOLE
- CURB INLET

100 50 0 100 200

SCALE: 1 INCH = 100 FEET

TBM INFORMATION

REFER TO TOPOGRAPHIC SURVEY FOR MORE INFORMATION, SHEETS C-030-C-033.

AREA 1	AREA 2	AREA 3	AREA 4
AREA 8	AREA 7	AREA 6	AREA 5
AREA 9	AREA 10	AREA 11	AREA 12

KEY PLAN

THE EXISTING INFORMATION SHOWN ON THESE PLANS IS PER THE SURVEY COMPLETED BY:
KC DEVELOPMENT
P.O. BOX 398
CAMAS, WA 98607
(360)-834-2519
DATED: 06/27/2016
THE CONTRACTOR SHALL VERIFY EXISTING SITE CONDITIONS AND CONTACT THE ENGINEER IF DISCREPANCIES ARE NOTED.

UTILITY STATEMENT

LOCATION OF EXISTING UNDERGROUND UTILITIES HAVE BEEN TAKEN FROM DRAWINGS AND FIELD LOCATES SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES. UTILITY LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. PRIOR TO BEGINNING ANY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EACH UTILITY

811 Know what's below. Call before you dig.

TC PURSUIT SERVICES, INC. | PROJECT BASIE
WOODBURN, OR
2210133.00

Trammell Crow Company | MACKENZIE. | COFFMAN ENGINEERS | lango.hansen LANDSCAPE ARCHITECTS PC

OVERALL DRAINAGE PLAN
TYPE III DESIGN REVIEW APPLICATION: 04/16/2021

C-500